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www.ijpaes.comReceived: 1st July 2014Revised: 8th Aug-2014Accepted: 9th Aug-2014**Research Note****THE RABBIT-FISHES (FAMILY SIGANIDAE) FROM THE COAST OF SULAWESI, INDONESIA**Andi Iqbal Burhanuddin¹, Budimawan¹ and Sahabuddin²¹Laboratory of Marine Biology, Department of Marine Science, Faculty of Marine Science and Fisheries, Hasanuddin University, Makassar, Indonesia²Department of Aquaculture, Faculty of Agriculture, Muhammadiyah University, Pare-pare, Indonesia

ABSTRACT: Fish diversity monitoring could be utilized as a basis for formulating management regulation of the fisheries resources. A study has been carried out to describe the Siganid fishes of the family Siganidae from the coast of Sulawesi, Indonesia. The study was conducted from September 2010 to August 2013. Two hundred and thirty five specimen of Siganid belonging 17 species were examined and identified: *Siganus argenteus*, *S. canaliculatus*, *S. corralinus*, *S. doliatus*, *S. fuscescens*, *S. guttatus*, *S. javus*, *S. lineatus*, *S. puellus*, *S. puelloides*, *S. punctatissimus*, *S. punctatus*, *S. spinus*, *S. vermiculatus*, *S. virgatus*, *S. sutor*, and *S. vulpinus*. Description and local name available of each species was given.

Key words: Siganid fishes, Sulawesi, Indonesia

INTRODUCTION

The Siganidae, popularly known a rabbit fishes is one of the marine resources abundance in the water of Indonesia. The largest rabbit fish grows to about 53 cm standard length (SL). All have large, dark eyes and small, somewhat rabbit-like mouths, which gives them their name. Most species have either bright colors or a complex pattern. This family is essentially marine, tropical Indo-West Pacific fishes. There are 28 known species in a single genus, *Siganus*. In some now obsolete classifications, the species having prominent face stripes—colloquially called foxfaces—are in the genus *Lo*. Other species, such as the masked spine foot (*S. puellus*), show a reduced form of the stripe pattern. Rabbit fishes are native to shallow waters in the Indo-Pacific, but *S. luridus* and *S. rivulatus* have become established in the eastern Mediterranean via Lessepsian migration [4].

As a single row of flattened, close-set teeth might suggest, they feed primarily on seaweeds. Consequently, most species live at depth of less than 15 m and half the species live as pair on coral reefs. The others are usually encountered in small schools. Of the latter, one species, *Siganus vermiculatus*, is almost exclusively estuarine; the remainder are not restricted to a single habitat but move between estuaries, coral reefs, rocky shores, and so on [8], [10], [12]. The Spermonde Archipelago located at South Sulawesi and be known for its marine fishes, the great diversity of which has not received special attention of ichthyologists and marine biologist. This area is estimated as approximately 150 km² of coral reef ecosystem which are distributed throughout the archipelago [1], [2]. The result of this work will be used as basis for further study especially on bio-diversity monitoring and would hopefully be utilized as a basis for formulating management regulation of the fisheries resources for the coast of South Sulawesi, Indonesia.

MATERIALS AND METHODS

Most specimens were purchased in the Gorontalo Fish Landing Port, Pare-pare Fish Landing Port, Rajawali Fish Landing Port and Paotere Fish Landing Port in Makassar, South Sulawesi, from September 2010 through August 2013. Other specimens examined and identified were recently captured by gill net from the Tanakeke Island, Barrang Lompo Island, Barrang Caddi Island and Kodingareng Island.

The market specimens purchased had been collected mostly by gill net, beach seine, hand-line and small trawl operated by local fisherman around Spermonde Archipelago. Most specimens examined have been deposited in the Laboratory of Marine Biology, Faculty of Marine Science and Fisheries, Hasanuddin University, Indonesia. Additional specimens were deposited in the Division of Fisheries Science, Faculty of Agriculture, Miyazaki University (MUFS), Japan. Counts and measurement of meristic and morphometric are as prescribed [5], [8]. Identification is based on [3], [7], [9], [11], and [12].

RESULTS AND DISCUSSION

Diagnostic Features of the Family Siganidae

The Siganidae with the following combination of characters: Body ovate, compressed, covered with very small scales. Dorsal fin continuous, usually with XIII spines and 10 soft rays, and preceded by an embedded; anal fin with VII spines and 9 soft rays; A sharp spine projects forward from origin of first dorsal spines and pierces then skin of nape; pelvic fins with an inner and outer spines separated by 3 soft rays; spine venomous. Palatines and tongue toothless. Mouth small, terminal, not protractile; teeth small, incisiform, bicuspid or tricuspid. Caudal fin truncate, emarginated or deeply forked. Another unusual feature among rabbit fishes is their pelvic fins, which are formed from two spines, with three soft rays between them. The fin spines are equipped with well-developed venom glands. All rabbit fish are diurnal; some live in schools, while others live more solitary lives among the corals. They are herbivorous, feeding on benthic algae in the wild.

Siganus argenteus (Quoy and Gaimard, 1825)

English name: Silver spine foot; streamlined spine foot

Local name: Baronang kea-kea

Descriptions (based on 15 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 18- 20. Scale rows above lateral line 18-23. Body compressed and depth 2.3 to 2.9, head 4.7 to 4.9 times in SL. Snout not tubular, caudal fin deeply forked; distinct notch between spinous and soft portion of dorsal fin.

Color in life: top of head and back light brownish with tiny dark spots. Cheeks, operculum and reminder of body silvery. Belly with vermiculating longitudinal lines. Spinous dorsal fin with a row of large, oval, dusky spot along middle and row of smaller ones near margin. Head and body covered by numerous, yellow spot or lines. Caudal fin with short vertical brown line basally. When removed from the water the colors fade rapidly. Common size 15 to 20 cm. (Fig. 2A).

Siganus canaliculatus (Park, 1797)

English name: White spotted rabbit fish

Local name: Belawasa, Biawasa

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 17-18. Scale rows above lateral line 17-21. Body compressed and depth 2.5 to 2.7, head 4.7 to 4.9 times in SL. Snout not tubular, caudal fin deeply forked; Pectoral fins shorter than head. Midline of thorax scale less between pelvic ridges.

Color in life: silvery gray above to silvery below, with touch of olive green on nape and upper surface of head. Side of body and nape covered with spots, pearly blue above to whitish below. Spots either round, ovoid or rod-shape; mostly of match head size but often smaller than this above lateral line and only pinhead size on nape. Back and sides with numerous blue spots. Fins orange and green. Ventral and pectorals lighter. When removed from the water the colors fade rapidly. Common size 15 to 35 cm. (Fig. 2B).

Siganus corralinus (Valenciennes, 1835)

English name: Blue spotted spine foot

Local name: Baronang Kea-kea; Kea-kea kuning

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 17-18. Scale rows above lateral line 17-23. Body depth 1.7 to 2.5, head 3.5 to 3.8 times in SL. Snout slightly projecting but not tubular; no distinct notch between spinous and soft portion of dorsal fin.

Fin spine stout and pungent. Check usually covered with strong, overlapping scales, but scales sometimes confined to poster ventral region. Midline of thorax including ridges fully scaled.

Color in life: Head, body and fins orange-yellow. Head, thorax, and side with pale blue ocelli with darker blue margins. Caudal fin with dark spot. Blue spots disappear shortly after death. Common size 15 to 20 cm.(Fig. 2C). *Siganus doliatus* Cuvier, 1830

English name: Barred spine foot

Descriptions (based on 10 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-19. Scale rows above lateral line 18-26. Body depth 1.8 to 2.4, head 3.3 to 3.7 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Spine stout but pungent. Caudal fin emarginated. Cheeks covered with strong scales.

Color in life: body blue above to silvery white below, decorated with about 30 yellow bar, variously joined below base of dorsal fin but free ends tapering away just above midventral line of body. A seal brown band diagonally from nape through eye to ocular, another from base of 4th to 5th dorsal spines to just below base of pectoral fin. Below eye, ocular band usually containing a pair of dark blue line running from orbit to corner of mouth. At death the brown color of the ocular and shoulder band fades, but the yellow areas contained within the bands become dark orange-brown which is much darker than other yellow markings of head and sides. Common size 15 to 20 cm. (Fig 2D).

***Siganus fuscescens* (Houttuyn, 1782)**

English name: Mottled spine foot

Local name: Belawasa

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-17. Scale rows above lateral line 17-21. Body depth 2.4 to 2.8, head 3.5 to 4.5 times in SL. Snout not tubular; distinct notch between spinous and soft portion of dorsal fin.

Color in life: olive green or brown above to silvery below; all of head and body, except for snout, covered with pearly blue spots. Spot small on head and nape, becoming larger on lower sides. Spots round, especially above lateral line and on head, but many on mid to lower sides may be slightly or strongly elongated horizontally. Anal fin, spinous part of dorsal fin, and pelvic fins same color as adjacent area of side. Soft part of dorsal fin and caudal fin dusky; pectoral hyaline. Common size 20 to 39 cm (Fig. 2E).

***Siganus guttatus* (Bloch, 1787)**

English name: Golden spine foot; Orange-spotted spine foot

Local name: Baronang buri, Baronang binti

Descriptions (based on 10 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-18. Scale rows above lateral line 21-26. Body depth 1.8 to 2.4, head 3.6 to 4.1 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Caudal fin truncate or weakly emarginated.

Color in life: dusky blue above to silvery below. Body with numerous large golden-brown blotched separated by a network of blue lines. The spots are relatively large in juveniles and fused into longitudinal patches with blue interspaces forming chains and longitudinal lines. Usually a large, pale yellow blotch below end of soft dorsal base. Dorsal, anal and caudal fins with round brown spots. Common size 15 to 39 cm. (Fig. 2F).

***Siganus javus* (Linnaeus, 1766)**

English name: Streaky spinefoot

Local name: Baronang buri, Baronang tulis

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 15-17. Scale rows above lateral line 32-38. Body depth 2.0 to 2.3, head 3.5 to 3.7 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Caudal fin emarginated.

Color in life: body dark bronze above to white on belly and thorax. Head and back with numerous small rounded gray spots, which are smaller than interspaces. Spots on side and belly become more elongate and tend to fuse into longitudinal pale lines. Cheeks golden yellow, spotted with blue; opercular area bronze and similarly spotted. Head with spots but no longitudinal streaks. Fins immaculate, generally brown, but pectoral yellow. Common size 15 to 25 cm. (Fig. 2G).

***Siganus lineatus* (Valenciennes, 1835)**

English name: Golden lined spine foot

Local name: Baronang buri, Baronang tulis

Descriptions (based on 10 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 15-17. Scale rows above lateral line 18 -27. Body depth 1.9 to 2.3, head 3.0 to 3.4 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Caudal fin emarginate in small juveniles but becoming more forked with increasing size.

Color in life: blue above to silvery below; broad, bronze, horizontal, wavy bands on side of body. A bright yellow spot about size of orbit on back immediately below last few rays of dorsal fin. Common size 25 cm (Fig. 2H). *Siganus puellus* (Schlegel, 1852)

English name: Blue-lined spine foot; masked spine foot

Local name: Baronang kea-kea; Baronang cura

Descriptions (based on 15 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 15-17. Scale rows above lateral line 20-25. Body depth 2.3 to 2.6, head 3.2 to 3.9 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Single diagonal dark band on head through eye. Cheeks fully covered with strong scales. Caudal fin prominently forked.

Color in life: body orange-yellow, marked with an intricate pattern of fine wavy lines grading from bluish above to silvery white below.

Head yellow-orange, with a prominent blackish bar, outlined with blue, running from chin through eye to nape; above eye, ocular bar contains a dozen or more crowded, large, black spots. Preoperculum with silvery lines as on side, frequently broken into rows of spots. Opercular area silvery. Snout and lips plain dusky orange-yellow. Spines and rays of dorsal and anal fin yellow. In preserved specimens the pattern of lines is retained only on the upper half of body; the lines become dark brown and the background pale. Fins yellowish and immaculate. Common size 20 cm. (Fig. 3A).

***Siganus puelloides* (Woodland & Randall, 1973)**

English name:

Local name: Baronang buri, Baronang tulis

Descriptions (based on 1 specimen): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16. Scale rows above lateral line 18. Body depth 2.3, head 3.2 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Cheeks fully covered with strong scales. Caudal fin prominently forked.

Color in life: head yellow-orange, with a prominent blackish bar, outlines with blue, running from chin through eye to nape; above eye, ocular bar contains a dozen or more crowded, large, black spot. Spine and rays of dorsal and anal fins yellow. Preoperculum with silvery lines as on side, frequently broken into rows of spot. (Fig. 3B).

***Siganus punctatissimus* (Fowler and Bean, 1929)**

English name: Peppered spine foot

Local name: Baronang Kaluku

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 15-18. Scale rows above lateral line 18 - 22. Body depth 2.0 to 2.3, head 3.6 to 4.1 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Cheeks completely covered with strong scales. Caudal very deeply forked, its lobes narrow, with pointed tips.

Color in life: head and body dark chocolate brown with a purplish hue, covered everywhere with minute, bluish white spots. Spot much smaller than scales and about same size as interspaces. A darker brown patch, about size of eye, below origin of lateral line.

Blackish margin around complete edge of caudal fin. Dorsal and anal fins rusty brown. Pectoral rays brown with rosy purple tint; the membranes hyaline. Preserved specimens dark chocolate, sometimes retaining pale minute spots on head and the large dark "shoulder patch". Common size 15 to 25 cm. (Fig. 3C).

***Siganus punctatus* (Foster, 1801)**

English name: Gold spotted spine foot

Lokal name: Baronang Kaluku, Baronang Ayam

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-17. Scale rows above lateral line 22 - 27. Body depth 1.8 to 3.2, head 3.2 to 4.1 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Cheeks fully covered with strong scales. Caudal lobes broadly rounded at tips, particularly the lower lobe.

Color in life: color pattern of this species changes with age. The color pattern on the caudal fin is an extension of that on the body; the spots, in rows along the fin ray. Body bluish. Fins and body covered with many orange spot. One dark blotch on shoulder. Common size 15 to 20 cm. (Fig. 3D).

***Siganus spinus* (Linnaeus, 1758)**

English name: Little pine foot

Local name: Baronang ante

Descriptions (based on 15 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 15-17. Scale rows above lateral line 14-18. Body depth 2.3 to 2.8, head 3.6 to 4.1 times in SL. Snout not tubular; distinct notch between spinous and soft portion of dorsal fin. Cheeks scales fine, but densely packed over lower two-third of preoperculum region. Caudal fin emarginated in juveniles, truncate in adults.

Color in life: this fish can adopt a number of camouflage patterns involving off-white, pale gray to blackish, and various shades of brown. Head and body with vermiculate pattern. The rays of soft portion of dorsal and anal fins bear 2 or 3 dark bands; membranes of this part of these fins hyaline dusky. Pectoral fins hyaline brown. Caudal fin brown, crossed by 3 or 4 pale, wavy bars which may only be distinct on outermost rays. The caudal peduncle is always marked with 4 or 5 irregular, off-white bars. Common size 20 to 35 cm. (Fig. 3E).

***Siganus vermiculatus* (Valenciennes, 1835)**

English name: Vermiculated spine foot

Local name: Baronang rante

Descriptions (based on 20 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-17. Scale rows above lateral line 17- 22. Body depth 1.9 to 2.2, head 3.2 to 3.9 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Cheeks with strong overlapping scales, the area covered usually extensive, sometimes absent from a strip just below orbit. Caudal fin emarginated.

Color in life: body bluish white covered with narrow vermiculating dark brown bands. Head brown to brownish yellow or golden yellow with irregular blue lines. Vermiculating pattern spreading onto base of caudal fin, but most of fin spotted. Pectoral fin membranes hyaline, the rays tinged with brown. Pelvic fin silvery, the outer spine and ray tinged with brown. Iris golden. Common size 20 to 30 cm (Fig. 3F).

***Siganus virgatus* (Valenciennes, 1835)**

English name: Doublebaret spine foot

Local name: Baronang kea-kea; Baronang cura

Descriptions (based on 10 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-17. Scale rows above lateral line 19 - 25. Body depth 1.8 to 2.2, head 3.2 to 4.0 times in SL. Snout not tubular; no distinct notch between spinous and soft portion of dorsal fin. Cheeks scalation very variable, ranging from a few scattered scales to almost fully scaled, but scales usually confined to posterior part of cheek. Caudal fin emarginated in juveniles to moderately forked in adults. *Color in life*: a brown band diagonally from nape to chin; another from base of 4th to 5th dorsal spines to base of pectoral fin; alternating blue and yellow line across interorbital area and snout, but sometimes broken into spots; 4 or 5 ephemeral orange line running from base of pectoral fin across thorax. The areas within the ocular and shoulder bands are spotted with blue (not with blue bands or lines as in *S. doliatus*). The cheeks are spotted with blue on yellow. Common size 15 to 20 cm. (Fig. 3G).

***Siganus vulpinus* (Schlegel and Muller, 1845)**

English name: Common fox face

Local name: Baronang cecet

Descriptions (based on 5 specimens): Dorsal fin spines XIII, 10; anal VII, 9; pectoral fin rays 16-17. Scale rows above lateral line 16–20. Body depth 1.8 to 2.4, head 3.4 to 3.5 times in SL. Snout projecting, tubular; no distinct notch between spinous and soft portion of dorsal fin. Caudal fin emarginate.

Color in life: An ocular bar of dark chocolate, its posterior margin running in an arc from base of 1st dorsal spine to chin; lips and iris same color.

Midline of head profile usually with a narrow white blaze which may run from lip to tip of procumbent dorsal spine or be confined to interorbital region. Broad diagonal black or dark brown bar on head through eye; similar colored area also on anterior part of body anterior to pectoral and pelvic base. Common size 15 to 20 cm. (Fig. 3H).

***Siganus sutor* (Valenciennes, 1853)**

English name: Mottled spine foot

Local name: Belawasa

Descriptions (based on 3 specimens): Dorsal fin spines XIV, 10; anal VII, 9; pectoral fin rays 16-18. Scale rows above lateral line 16–20. Body depth 1.8 to 2.4, head 3.4 to 3.5 times in SL. Snout projecting, tubular; no distinct notch between spinous and soft portion of dorsal fin. Caudal fin emarginate.

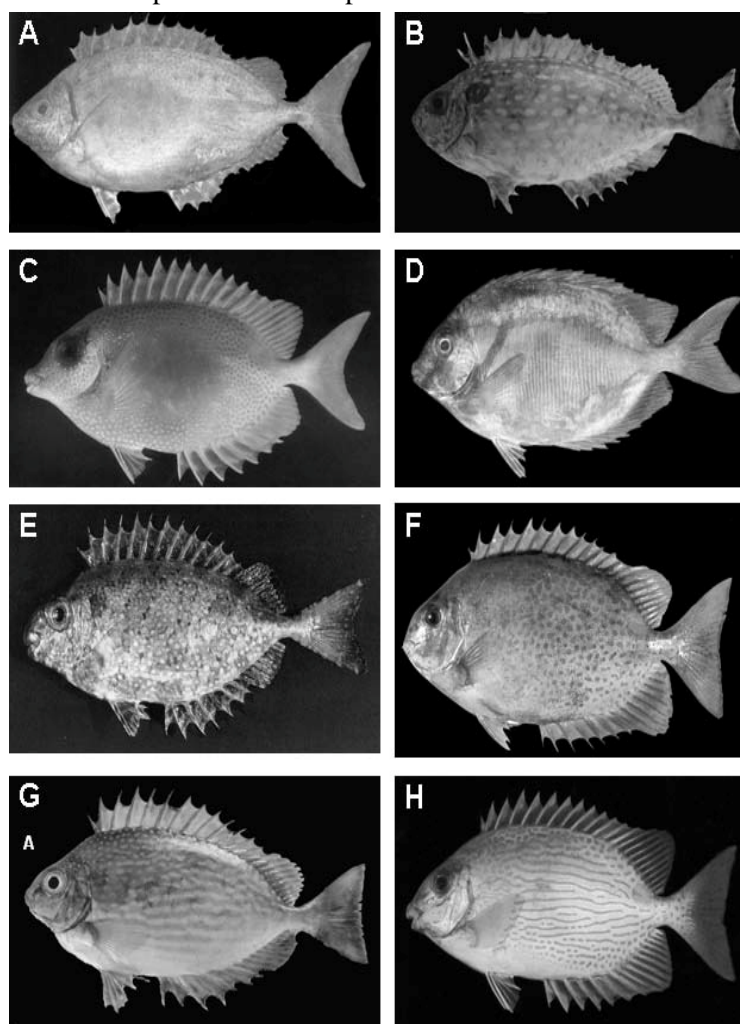


Fig. 1. Siganid fishes of the Spermonde Archipelago. A: *Siganus argenteus*; B: *Siganus canaliculatus*; C: *Siganus corallinus**; D: *Siganus doliatus*; E: *Siganus fuscescens*; F: *Siganus guttatus*; G: *Siganus javus*; H: *Siganus lineatus** * adopted from Woodland, 1990.

Color in life: Regularly greenish to sandy brown above to paler below; about 35-50 round spot, evenly dispersed in 6 rows, over entire side of body; spots about size of pupil, larger toward midside: upper row of spots lying on just above lateral line. Rays of soft part of dorsal fin hyaline, barred with brown, membrane hyaline. Caudal fin yellow brown. Pectorals hyaline. When removed from the water the colors fade rapidly.

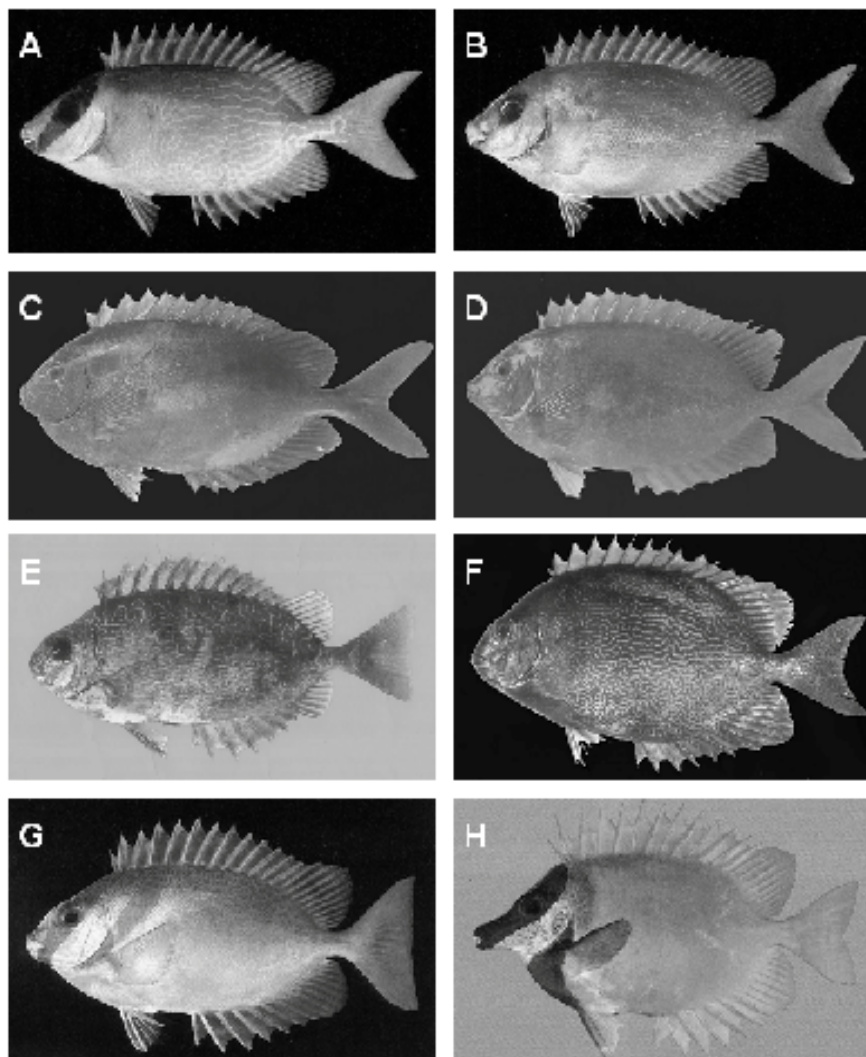


Fig. 2. Siganid fishes of the Spermonde Archipelago. A: *Siganus puellus**; B: *Siganus puelloides*; C: *Siganus punctatissimus*; D: *Siganus punctatus* ; E: *Siganus spinus*; F: *Siganus vermiculatus*; G: *Siganus virgatus**; H: *Siganus vulpinus*

* adopted from Woodland, 1990.

CONCLUSION

There are 17 species of the family Siganidae occurring in the area of the coast of South Sulawesi, Indonesia: *Siganus argenteus*, *S. canaliculatus*, *S. corralinus*, *S. doliatus*, *S. fuscescens*, *S. guttatus*, *S. javus*, *S. lineatus*, *S. puellus*, *S. puelloides*, *S. punctatissimus*, *S. punctatus*, *S. spinus*, *S. vermiculatus*, *S. virgatus*, *S. vulpinus*, and *S. Sutor*.

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